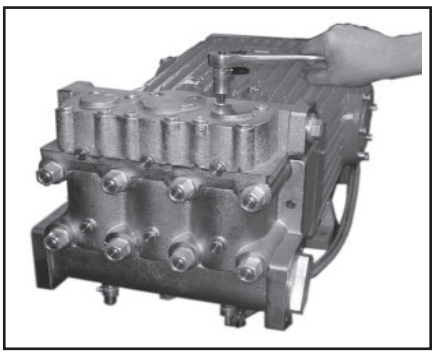
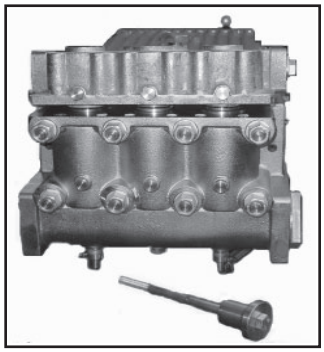
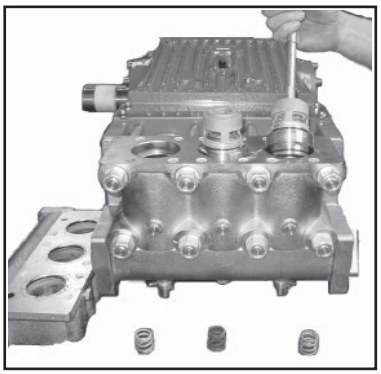
Valve Inspection and Repair



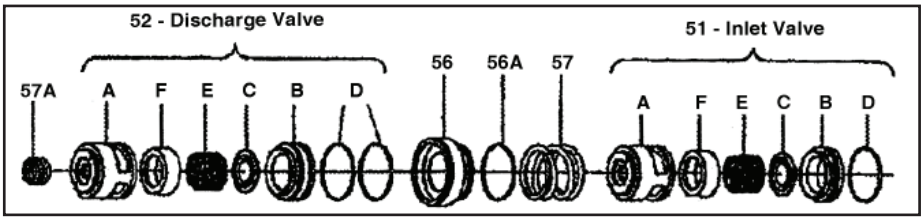
1) Remove socket head cap screws (58)



2) Lift discharge casing (50B) up and away.

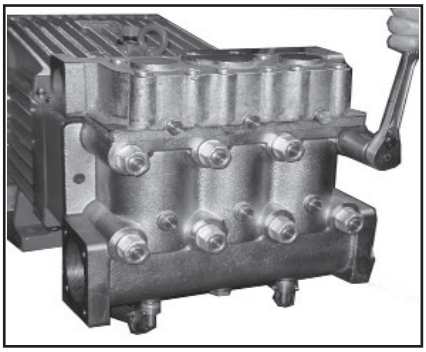


3) Take out pressure springs (57A). Pull out assembled valves (51 & 52) with valve puller.

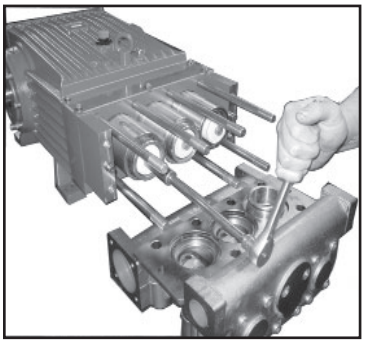


4) Remove valve assembly (52) from discharge valve adapter (56) by gently twisting apart. The spring tension cap (51A, 52A) is screwed together with the valve seat (51B or 52B). Remove spring tension cap. Takeout springs (51E, 52E) and valve plate (51C, 52C). Check sealing surfaces of valve plates (51C & 52C) and valve seats (51B & 52B) and O-rings (51D, 52D). Replace worn parts. Coat threads of valve seat with silicon grease or molycote anti-seize Cu-7439 when reassembling. Before refitting the valves, clean the sealing surfaces in the casing and check for any damage. Coat o-rings (51D, 52D & 56A) with silicone grease to help with re-assembly. Replace valve assembly (51) and pressure spring (57). Assemble valve assembly (52) to discharge valve adapter (56) by tapping together lightly with rubber mallet. While replacing the valve assemblies use a rubber mallet to tap the top of the valve puller lightly. This insures proper seating. Replace pressure spring (57A) and the discharge casing (50B). Tighten caps (58) at 132 Ft-lbs. (180 Nm); check torque tension after 8-10 operating hours.

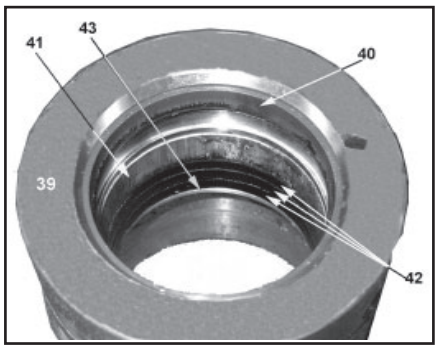
To Check Seals and Plunger Pipe



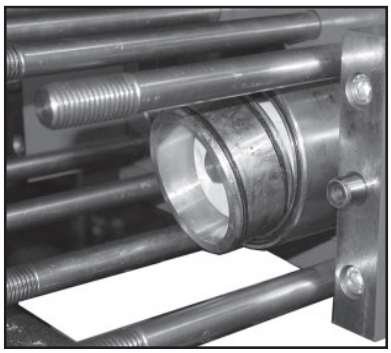
5) Remove hexagon nuts (49A) and valve casing together with seal case (38) from crankcase (1). If necessary, carefully tap the valve casing (50) past the centering stud (50A) using a rubber hammer.
IMPORTANT! If necessary, support the valve casing by resting it on wooden blocks or by using a pulley.



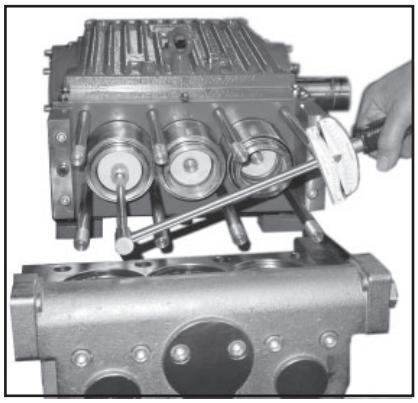
6) Remove tension screw (36C) and take seal sleeve (39) together with all mounted parts out of the drive. Pull plunger pipe (36B) out of the seal assembly and check for any damage. Carefully, remove seal rings (40) and sleeves (42) with a screwdriver.



7) Important! Be careful not to damage the seal sleeve (39) and pressure ring (41). Check the inner diameter of the pressure ring for wear and if necessary replace together with seals (40) and (42). Clean all parts. New parts should be lightly coated with silicon grease before installation. Insert the seal unit (40, 41, 42 43) into the sleeve. Push the ceramic plunger carefully through the seals from the crankcase side. If necessary, the seals can be held tightly using a suitable pipe support held on the other side of the seal sleeve.

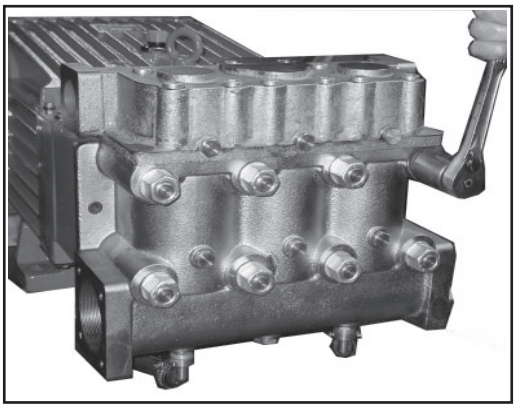


8) Take out the seal case (38) from the valve casing (50) and check o-rings (38A) (if necessary secure two screwdrivers in the front o-ring groove to extract seal casing from valve casing). Coat seals with silicon grease before installing.
Important! Mounting surfaces of the crankcase and the valve casing must be clean and free of damage. The components must lie exactly and evenly on one another. The same exactness applies for all centering positions in the crankcase, pressure and valve casing.



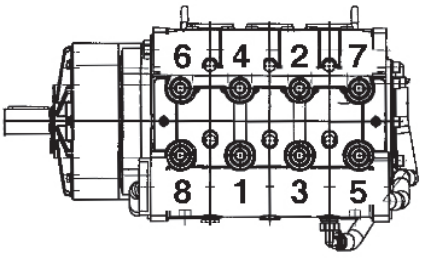
9) Coat the seal sleeve(39) lightly with anti-corrosive grease (e.g. molycote no.Cu-7439) in its fitted area towards the crankcase. Insert the seal sleeves in to their crankcase fittings. Coat the threads of the tension screw (36C) lightly with thread glue and insert it together with a new copper ring (36D) through the ceramic pipe. Turn the pump by hand until the plunger (25) rests against the plunger pipe. Tighten the tension screw at 30 Ft-lbs. (40 NM)

Important! Thread glue must never come between the plunger pipe (36B) and centering sleeve (36E). Overtensioning of the plunger pipe by excessive tightening of the tension screw and/or dirt or damage on the mounting surfaces can lead to plunger pipe breakage. Insert the seal tension spring (45) and o-ring (39A) in to the seal sleeve (39).



Replacing Valve Casing:

10) Put seal cases (38) in the centering holes of the valve casing, then push valve casing carefully on to centering studs (50A). Tighten hexagon screws (49A) evenly and crosswise at 265 Ft.-lbs. (360 NM). Follow pattern below.



Important! The torque tension on the screws (49A) must be checked after 8-10 operating hours; the pump must be at zero pressure. Thereafter, the tension is to be checked every 200 operating hours.

To Dismantle Gear

Take out plungers and seal sleeves as described above.
Drain oil by taking off plug (12).
After removing the clip ring (33B), remove the seal retainer (33) with a screwdriver. Open hose adaptor (K11). Remove gear cover (K3) and remove the cooling vane plate (K1) by unscrewing the screws (K4). Remove connecting rod screws (24).
IMPORTANT! Connecting rods are marked for identification. Do not twist connecting rod halves or interchange them. When reassembling, the connecting rods must be fitted in their exact original position on the crankshaft journals.
Push connecting rod halves together with the crosshead as far as possible into the crosshead guide.
Remove bearing cover (14), remove shims (21A/B).

To Dismantle Gearbox

Remove screws (67). Press off gear cover (66) by screwing two screws into both thread bores. Remove screw (72) and take off plate (71). Remove the gearwheel (69) from the shaft with a bearing removal tool.
Using a rubber hammer, tap out the crankshaft towards bearing cover (14).
Check surfaces on the connecting rods (24), crankshaft (22) and crossheads (25). Check the surfaces of the crosshead guides in the crankcase (1) for any unevenness.

Reassemble in reverse order. Thread the crankshaft in from the bearing cover side until the bearing rests cleanly in the outer ring on flange (19).
Press in the outer ring from bearing (20) and using shims (21A/B/C), adjust the bearing to be free of play. To achieve this, add shims, screw on cover (14) and turn the crankshaft until it can no longer be turned by hand.

Then remove a shim and establish whether the crankshaft can now be turned. A crankshaft that can be too easily turned may cause damage to the bearings (20/21) and connecting rods (24) due to the wobble movements in the conical bearing shells.

If bearings (20 & 21) have been replaced, the flange (19) must be taken off and a new bearing outer ring pressed in until the surfaces are even. Then mount the holding flange to push the bearing outer ring in deeper.

Mount connecting rod halves in their exact original position and tighten at 37 ft.-lbs. (50 Nm).

IMPORTANT! A little clearance must exist to enable slight sideward movement of the connecting rod on its journal.

Mount cooler plate (K1) and gear cover (K3) with their respective seals (K2). When assembling the cooling circuit line, make sure that the oil cooler connection (K7) is always joined to the upper connection (K3) of the gear cover.

To Reassemble Gearbox

Heat ball bearings (74 & 75) first before pressing them onto the pinion. Press the cogwheel slightly onto the crankshaft (22) so that the pinion shaft (69) together with the bearing (74) can still be inserted.
Move the pinion shaft against the cogwheel and make them mate perfectly when mounting. Carefully tap the cogwheel and the pinion shaft simultaneously onto the crankshaft and into the bearing seat.
Fit fitting disc (69), and secure screw (72) with Loctite.
Fit the seal (76) onto the cylindrical pins (68).
Push the gear cover (66) carefully onto the bearing (75). Make sure that no damage to the radial shaft seal (73) occurs during the fitting onto the pinion shaft.

IMPORTANT! Before putting into operation again, turn the reduction gear shaft by hand at least four full turns to make sure the gear is correctly aligned.